

## Multivariate Data Analysis (C002776)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size (nominal values; actual values may depend on programme)  
Credits 5.0 Study time 135 h Contact hrs 60.0 h

Course offerings in academic year 2020-2021

Lecturers in academic year 2020-2021

Sabbe, Koen	WE11	lecturer-in-charge
Adriaens, Dominique	WE11	co-lecturer
De Troch, Marleen	WE11	co-lecturer
Vanaverbeke, Jan	WE11	co-lecturer

Offered in the following programmes in 2020-2021

	crdts	offering
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Teaching languages

English

Keywords

Multivariate data analysis, morphometry, community ecology, ordination

Position of the course

Students learn how to analyze multivariate morphological or community ecological data using modern statistical software.

Contents

- 1 General introduction to multivariate data analysis: aim, general concepts - variance, covariance, correlation, basic concepts in matrix calculus, variance-covariance matrices, eigenvalues and eigenvectors, Principal Components Analysis (including partial PCA), Multivariate Analysis of Variance, Randomisation testing in multivariate analysis
  - 2 Multivariate analysis techniques for morphometric data: traditional morphometrics - biometrics, geometric morphometrics, exploring shape variation within and between taxonomic units, testing hypotheses of shape variables between taxonomic units, analysis of evolutionary shape changes. Lectures include practical case studies of data acquisition and statistical analyses using MS Office and freeware statistical packages (TPS-series, PAST, SHAPE).
  - 3 Multivariate techniques in community ecology: indirect and direct ordination techniques: correspondence analysis (CA), canonical correspondence analysis (CCA), redundancy analysis (RDA), multidimensional scaling, PERMANOVA, variance partitioning.
- The theoretical part is supplemented with practical exercises and an assignment.

Initial competences

The course builds on the basic statistical concepts taught in Statistics I (Biol Ba1), Biostatistics (Biol Ba3) and Advanced biostatistics (Biol Ma1).

Final competences

- 1 The student knows and understands the most important basic concepts and principles of multivariate data analysis as applied to morphometric and ecological research.
- 2 The student is able to independently extract the essential information from morphometric and ecological multivariate datasets by selecting and applying the appropriate multivariate techniques.
- 3 The student is able to formulate the statistical results scientifically and to depict them

graphically in an appropriate way.

#### Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

#### Conditions for exam contract

This course unit cannot be taken via an exam contract

#### Teaching methods

Lecture, self-reliant study activities, seminar: practical PC room classes

#### Extra information on the teaching methods

(1) seminar practical PC room classes: analysis of biological and simulated datasets using specialised multivariate analysis software  
(2) an (individual) assignment in which the student chooses between several ecological or morphometric data sets. This will enable the student to gain more in-depth knowledge of the most relevant statistical methods. For the Oceans & Lakes students, the individual assignment also includes an additional part on Permanova and Multidimensional Scaling.

#### Learning materials and price

Powerpoint slide notes available for the theoretical background as well as for the use of statistical software.

#### References

Legendre & Legendre (1998). Numerical ecology. Elsevier.  
Lepš & Šmilauer (2003). Multivariate analysis of ecological data using Canoco. Cambridge University Press.  
McCune & Grace (2002). Analysis of ecological communities. MjM Software design.  
Zelditch, Swiderski, Sheets & Fink (2004). Geometric morphometrics for biologists. Elsevier (ISBN 0-12-77846-08).

#### Course content-related study coaching

Opportunity for questioning the lecturers during the orals and seminars, and outside these via email, personal contact and via the electronic teaching environment.

#### Evaluation methods

end-of-term evaluation

#### Examination methods in case of periodic evaluation during the first examination period

Oral examination, assignment

#### Examination methods in case of periodic evaluation during the second examination period

Oral examination, assignment

#### Examination methods in case of permanent evaluation

#### Possibilities of retake in case of permanent evaluation

not applicable

#### Extra information on the examination methods

Periodic evaluation: after written preparation, the answers are discussed with the examiner(s). Additional questions may be asked. In addition to the exam, the assignment is also discussed.

#### Calculation of the examination mark

1st and 2nd examination period: periodic evaluation (100 %). The assignment is discussed during the oral exam and counts for 50% of the final score. To succeed for this course, the students are obliged to follow the seminars and make the assignment.